EIR–LEVEL SOIL AND GEOLOGIC RECONNAISSANCE

QUARRY CREEK II CARLSBAD/OCEANSIDE, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

THE CORKY MCMILLIN COMPANIES
SAN DIEGO, CALIFORNIA

OCTOBER 20, 2011
PROJECT NO. 07135-42-01B

GEOCON
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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07135-42-01B
October 20, 2011

The Corky McMillin Companies
Post Office Box 85104
San Diego, California 92186

Attention: Mr. Don Mitchell

Subject: EIR–LEVEL SOIL AND GEOLOGIC RECONNAISSANCE
QUARRY CREEK II
CARLSBAD, CALIFORNIA

Dear Mr. Mitchell:

In accordance with your request, we have prepared this report to address soil and geologic information for the proposed Quarry Creek II project in Carlsbad, California. Conclusions and recommendations of this study are based on review of available published geotechnical reports and literature, observations during grading currently being performed on the property, previous subsurface geotechnical exploration and site reconnaissance of existing conditions.

Previous use of the eastern half of the property consisted of mining and crushing rock to produce commercial aggregates. Mining has resulted in the eastern half of the site being underlain by compacted fill, previously placed fill, undocumented fill, sedimentary, volcanic, and intrusive bedrock. Currently, reclamation grading is occurring on this portion of the site. The western half of the site is in an ungraded natural condition. The accompanying report presents findings from our studies relative to geotechnical engineering aspects of developing the site. No soil or geologic conditions were encountered which would preclude development.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

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EIR–LEVEL SOIL AND GEOLOGIC RECONNAISSANCE

1. PURPOSE AND SCOPE

This reconnaissance study has been prepared to identify soil and geologic conditions for Quarry Creek II, an approximately 45-acre parcel of land located south of Highway 78 and west of College Boulevard, in Carlsbad, California (see Vicinity Map, Figure 1). The study is also conducted to provide preliminary recommendations regarding geotechnical aspects and constraints associated with developing the property and associated improvements.

The scope of our study consisted of performing a field reconnaissance and geologic mapping by an engineering geologist. In addition, we reviewed aerial photographs, published geologic literature and the following documents previously prepared for the property:

1. *Update Geotechnical Investigation, Amended Reclamation Plan, Quarry Creek Refined Alternative 3, Carlsbad, California,* prepared by Geocon Incorporated, dated September 10, 2009 (Project No. 07135-42-01).

2. *Limited Geotechnical Investigation to Evaluate Hardrock Constraints for Quarry Creek, Carlsbad, California,* prepared by Geocon Incorporated, dated April 9, 2004 (Project No. 07135-42-01B.

For purposes of this study, our engineering geologist mapped surficial soils and rock formations by observing surface outcrops, reviewing published geologic maps, and observations during reclamation grading that is currently occurring on the eastern half of the property. Mapped information is depicted on the Geologic Map (Figure 2, Map Pocket). Other reports reviewed as part of this study are summarized on the *List of References* at the end of this report.

2. SITE AND PROJECT DESCRIPTION

The Quarry Creek II area encompasses approximately 45 developable acres of property that has undergone many years of mining rock with associated crushing and screening to produce commercial aggregate products. The majority of previous mining activity occurred in the eastern and southern portions of the site. Waste products from mining were subsequently placed in canyon or pit areas to reclaim quarry excavations. This has resulted in placement of mostly undocumented fill in depressions, as well as some compacted fill. A former concrete batch plant and base-coarse crushing and screening plant operated by Hanson Aggregates occupied the central portion of the property. Other portions of the property were previously used for storage purposes, which include stockpiles of concrete and asphalt rubble, bioremediation stockpiles, and other materials.

Reclamation grading of the previously mined area commenced in July 2011 and is expected to continue until early 2012. During reclamation grading, undocumented fills are being removed and

recompacted. Alluvial soils within the drainage area is being removed to within 3 feet of the current groundwater elevation and recompacted. Drop structures, levees, and rock revetment slopes are being constructed along and in Buena Vista Creek drainage. Currently, reclamation grading has resulted in removal of undocumented fill and replacement with compacted fill on the north side of Buena Vista Creek. Reclamation grading south of the creek is just beginning. Reclamation grading will result in large sheet graded pads on the eastern half of the property on both the north and south sides of Buena Vista Creek.

Topographically, the property slopes northward, southward, and westward, following the east-west natural drainage of Buena Vista Creek valley and its tributaries. The original valley-slope topography has been lowered by quarry operations to create moderately sloping surfaces in most of the planned reclamation area. However, mining of rock in the northeast quadrant has created near-vertical rock slopes. The cut has exposed fractured rock, which is very strong and considered stable in its temporary steep condition. Slopes on the south side of the valley have been graded to permanent 2:1 (horizontal:vertical) cut slopes with benches, bench-drains and brow-ditches. On the north side of the site, reclamation grading has resulted in 2:1 cut slopes. Elevations in the eastern half of the property vary from approximately 80 feet Mean Sea Level (MSL) to above 300 feet MSL in open-space areas. At the completion of reclamation grading, sheet graded pad elevations will vary from approximately 100 to 120 feet MSL. On the western ungraded portion of the site, existing site elevations vary from approximately 80 feet MSL to 160 feet MSL.

Review of the preliminary grading plan for Quarry Creek II indicates regrading in the eastern half of the property after reclamation grading will generally consist of cuts and fills up to 40 feet and 10 feet, respectively. Within the ungraded western portion, cuts and fills up to 35 and 30 feet, respectively will occur to create large sheet-graded pads.

The site description and proposed development are based on a site reconnaissance and a review of the reclamation plans and preliminary grading plans. If development plans differ significantly from those described herein, Geocon Incorporated should be contacted for review and possible revisions to this report.

3. SOIL AND GEOLOGIC CONDITIONS

Seven surficial soil deposits and four geologic formations were encountered and/or mapped on the property. Surficial soil deposits include undocumented fill, compacted fill, previously placed fill, topsoil (unmapped), alluvium, and colluvium. Formational units include Quaternary-age Terrace Deposits, Tertiary-age Volcanic Rock, Santiago Formation, and Jurassic-age Salto Intrusive rock. Mapped limits of the geologic units are shown on the Geologic Map (Figure 2). The surficial soil types and geologic units are described below.

3.1 Compacted Fill (Qcf)

Compacted fill placed during reclamation grading exists across the northeast portion of the property. Observation and compaction testing of the fill has been performed by Geocon Incorporated. A report documenting compaction tests will be provided at the completion of reclamation grading. The fill is predominately comprised of silty to clayey sand with varying amounts of rock fragments, soil rock fills, and windrows of oversize rock and concrete. A 10-foot hold-down has been recommended during reclamation grading.

3.2 Undocumented Fill (Qudf)

Undocumented fill exists across the majority of the south-central and southeastern portions of the property. The undocumented fill is typically within previously mined areas. Estimated maximum thickness could exceed 25 feet, especially beneath stockpile areas. These fills are the result of waste product generated from mining activities being stockpiled and/or spread out across the property. The undocumented fill is comprised of loose, dry to wet, very porous, sandy, coarse gravel with oversize rock fragments. The undocumented fill is unsuitable in its present condition, and will require removal and recompaction to support additional fill or structural improvements. Oversize materials encountered during remedial grading may require breaking down and/or special placement procedures.

In the northeast portion of the property, a limited amount of undocumented fill was left in-place due to the presence of groundwater during reclamation grading. Based on our observations during reclamation grading, we expect less than 3 to 5 feet of fill was left below groundwater in some areas. We do not expect the presence of the undocumented fill to impact future development and will provide recommendations for settlement monitoring and surcharging, if needed, in update geotechnical reports for Quarry Creek II.

3.3 Previously Placed Compacted Fill (Qpcf)

A limited area in the northeastern portion of the property is underlain by previously placed compacted fill (see Geologic Map). According to a report by Ninyo and Moore (dated August 31, 2000), most of the approximately 10 feet of documented fill in the bottom of the northern pit area had been placed between approximately 1988 and 2000. The report describes the fill as … *interlayered, medium dense to dense, clayey and silty sand, clayey gravel and stiff sandy clay*. Portions of the compacted fill were buried beneath stockpiles of oversize shot-rock that was removed during recent reclamation grading. The upper approximately 3 to 5 feet of previously placed compacted fill was removed during reclamation grading and recompacted.

3.4 Previously Placed Fill (Qpf)

The approximate area of previously placed fill associated with residential developments along the southern boundary and near Haymar Road and Highway 78 along the northern property boundary is shown on Figure 2 (Geologic Map). Previously placed fill associated with the development of the eastern quarry (Wal-Mart shopping center) abuts the southeastern property line. These soils include either undocumented or compacted fill that may represent *edge conditions* and may require remedial grading. A determination to the extent of removals will be determined during grading based on the condition of the fill encountered.

3.5 Topsoil (Unmapped)

Portions of the site are irregularly blanketed by 1 to 3 feet of topsoil consisting of loose, porous, dark brown, silty to clayey, fine sand. Topsoil is compressible in its present condition, and will require removal and recompaction within areas of planned development.

3.6 Alluvium (Qal)

Alluvial deposits are present within the major east-west drainage of Buena Vista Creek, as well as in the northeastern and southwestern tributary canyons that converge with Buena Vista Creek in the central portion of the site. The alluvial soils generally consist of loose, porous dark gray to olive brown, very clayey, fine to medium sand, and clayey sand and silt. Areas of deepest alluvium are located in the central portion of the site adjacent to the original channel of Buena Vista Creek and its tributaries. The alluvium is compressible and not suitable for support of additional fill and/or structural loads and will require partial (dependent upon groundwater depths) to complete removal. The majority of remedial grading of the alluvium along the north and south sides of the main Buena Vista Creek drainage has occurred or will occur during the reclamation grading currently in progress. Alluvium is expected to be encountered along the toe of the south facing fill slope at the west end of the property.

3.7 Colluvium (Qcol)

Colluvial deposits were encountered in the southwest portion of the site mostly along northward-draining tributary canyons. Previous exploratory trenches encountered 4 feet to 6 feet of loose dark brown, very clayey to silty, fine sand. Due to the loose unconsolidated condition of the colluvium, removal and recompaction will be required to provide suitable support for placement of compacted fill or structural improvements.

3.8 Terrace Deposits (Qt)

Extensive and thick river terrace deposits consisting of medium-dense to dense, light reddish-brown to olive-brown, gravelly, silty to clayey, medium to coarse sand are present in the northwest and southwest portions of the site. Except near depositional contacts (or unconformities) with older formations, this unit is typically massive to horizontally bedded, relatively dense and exhibits low compressibility characteristics. Terrace Deposits are most prevalent in the southwestern portions of the site. These soils are suitable for support of fill and/ or structural loads in their present condition. Excavations, if they occur within this unit, should provide a sufficient quantity of *very low* to *low* expansive soil for capping of pads and streets.

3.9 Tertiary Volcanics (Tv)

Tertiary-age volcanic rocks are present in a limited lens-shape area exposed in the southeast portion of the site in the existing 2:1 cut slope between approximate elevations 120 to 140 feet MSL. It consists of deeply weathered, massive light reddish-brown, moderately strong, volcanic tuff. This unit exhibits medium-dense to dense characteristics with little indication of slope erosion. This unit is considered to possess suitable geotechnical characteristics for slope stability and for support of fill and/or structural loads.

3.10 Santiago Formation (Ts)

The Eocene-aged Santiago Formation, consisting of dense, massive bedded light brown to greenish-gray sandstones and thin interbedded siltstones is present in the north-central and south-central portions of the site.

The Santiago Formation is generally granular and possesses suitable geotechnical characteristics in either an undisturbed and/or properly compacted condition. However, the occurrence of clayey siltstones and claystone layers in this unit may generate moderate to highly expansive materials, or localized expansive zones at grade. Clayey zones of the Santiago Formation, if encountered during normal planned excavations, should be placed at least 5 feet below proposed subgrade elevations.

3.11 Salto Intrusive (Jspi)

The Jurassic-aged Salto Intrusive consists of a steeply jointed, dark gray, very strong tonalite to gabbro rock considered to be older than the Peninsular Range Batholith and more closely related to the formation of the Santiago Peak Volcanics (Larsen, 1948). This granitoid bedrock unit is present in the northeast and southeast corners of the property and is the predominant geologic unit that has been mined for aggregate on the property. Typically, this bedrock unit outcrops along the eastern or

southeastern boundary of the site, or is covered by fill in the central portions of the site. Exploratory excavations encountered mostly buried intrusive rock that exhibited a variable weathering pattern ranging from intensely weathered and fractured material near contacts with the overlying sedimentary rocks, to fresh, extremely strong crystalline rock within quarried areas.

4. GROUNDWATER

Groundwater was encountered in the major lower elevation drainage areas of Buena Vista Creek and its tributaries at elevations between 70 to 80 feet MSL. Depth of groundwater is subject to fluctuation from natural seasonal variations. The relationship between alluvial removals and the position of groundwater table and time of year remedial grading is performed are discussed in the *Conclusions and Recommendations* section of this report.

5. GEOLOGIC HAZARDS

5.1 Faulting and Seismicity

Review of geologic literature, previous geotechnical reports for the property, and observations during previous field investigation indicates no active faults traverse the property. One fault was observed in Salto Intrusive rock across the quarry slope in the northwest corner of the property. However, an exploratory trench excavated through the Tertiary Santiago Formation across the fault confirmed the fault did not displace the Eocene-age sedimentary unit. As such, the fault is considered inactive and not a constraint to the property.

According to the results of the computer program *EZ-FRISK* (Version 7.30), 14 known active faults are located within a search radius of 50 miles from the property. The nearest known active fault is the Newport-Inglewood (Offshore) Fault, located approximately 8 miles east of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood (Offshore) Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport (Inglewood Offshore) Fault are 7.2 and 0.31 g, respectively.

We used *Boore-Atkinson* (2008) NGA USGS2008, *Campbell-Bozorgnia* (2008) NGA USGS 2008, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships in the calculation of the peak ground accelerations (PGA). Table 5.1.1 lists the estimated maximum earthquake magnitudes and PGA's for the most dominant faults for the site location calculated for Site Class D as defined by Table 1613A.5.3 of the 2010 CBC.

TABLE 5.1.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood (Offshore)	8	7.2	0.26	0.24	0.31
Rose Canyon	8	7.2	0.26	0.24	0.31
Elsinore (Temecula)	21	7.2	0.17	0.12	0.14
Elsinore (Julian)	22	7.5	0.19	0.13	0.17
Coronado Bank	24	7.7	0.19	0.13	0.18
Elsinore (Glen Ivy)	32	7.2	0.14	0.09	0.10
San Joaquin Hills Thrust	36	6.7	0.11	0.09	0.08
Palos Verde	38	7.4	0.13	0.08	0.10
Earthquake Valley	42	6.9	0.10	0.06	0.06
San Jacinto (Anza)	44	7.6	0.13	0.08	0.10
San Jacinto (San Jacinto Valley)	45	7.3	0.11	0.07	0.08
Newport-Inglewood	47	7.2	0.10	0.07	0.07
Chino (Central Ave)	47	6.8	0.09	0.06	0.05
San Jacinto (Coyote Creek)	50	7.2	0.09	0.06	0.07

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the fault slip rate. The program accounts for fault rupture length as a function of earthquake magnitude. Site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) in the analysis. Table 5.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence for Site Class D.

TABLE 5.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.58	0.46	0.57
5% in a 50 Year Period	0.46	0.35	0.44
10% in a 50 Year Period	0.37	0.29	0.34

The California Geologic Survey (CGS) provides a computer program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on the average value of several attenuation relationships. Table 5.1.3 presents the calculated results from the Probabilistic Seismic Hazards Mapping Ground Motion Page from the CGS website.

TABLE 5.1.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.23	0.26	0.30

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) guidelines.

5.2 Liquefaction

Liquefaction analyses were performed during Geocon's 2009 report for reclamation grading. Results of the analyses indicate alluvial deposits below the groundwater should not liquefy for the design level acceleration. As the analysis shows liquefaction should not occur, potential impacts associated with liquefaction such as surface manifestation (sand boils) and lateral spreading are not considered to be adverse with respect to the proposed development.

5.3 Landslides

Review of 1995 published landslide maps of the California Geological Survey (formerly the Division of Mines and Geology) and a previous geotechnical report by Ninyo and Moore (August 23, 2000), suggested the presence of suspected landslide deposits in the southwest quadrant of the site. However, observations of intact outcrops and confirmation of undisturbed slope conditions during

previous field studies suggest that the landslide does not exist. Geocon evaluated the area during previous investigations by geologic mapping and excavation of exploratory trenches within the mapped slide area. The exploratory trenches encountered intact medium-dense, massive to horizontally bedded Terrace Deposits. Based on the trench data and exposed outcrops, we suspect the landslide does not exist. However, a geotechnical investigation with large diameter borings should be performed to confirm the presence or absence of the landslide.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 This report has been prepared to identify site soil and geologic conditions and potential geologic constraints within the Quarry Creek II property boundaries. Based on our study, development as shown on the preliminary grading plan is feasible. Additional site-specific geotechnical studies should be performed to provide specific grading and foundation recommendations for proposed development.

6.1.2 Soil conditions identified during this study that may impact development include compressible surficial soils (undocumented fill, alluvium, colluvium, and topsoil) that will require remedial grading. Undocumented fill may contain large rock fragments that require special placement procedures. However, we expect the majority of undocumented fill will be removed and recompacted during reclamation grading.

6.1.3 The Salto Intrusive may be very difficult to excavate and may require breaking and/or blasting to reduce the rock to manageable size and special placement within fill areas. Hard rock *knobs* or isolated ridges may be encountered that will require heavy ripping and/or blasting in deeper cut areas.

6.1.4 A suspected landslide is mapped in the southwest portion of the property. Exploratory excavations and field mapping to date suggests the landslide does not exist. Further investigation will be required to confirm the presence or absence of the landslide.

6.2 Soil and Excavation Characteristics

6.2.1 The majority of soils are expected to have very low to medium expansion potential. Some of the surficial soils and portions of the Santiago Formation could have high expansive soil conditions. Grading should occur such that high expansive soils are placed below a depth of at least 3 feet below finish pad grade.

6.2.2 Excavation of the surficial soils (undocumented fill, topsoil, alluvium, colluvium) are expected to require a light to moderate effort with conventional heavy-duty earthmoving equipment. Large rock fragments in the undocumented fill may require difficult handling procedures. Excavation of the Terrace Deposits, Santiago Formation and weathered portion of the Tertiary Volcanics and Salto Intrusive are expected to require a heavy to very heavy effort to excavate. Less weathered and fresh Salto Intrusive bedrock may require blasting or specialized rock breaking techniques to efficiently excavate and handle.

6.3 Preliminary Grading Recommendations

6.3.1 The following grading recommendations are preliminary and intended to provide general criteria to assist in overall planning. Detailed recommendations should be provided in an updated geotechnical report based on subsurface explorations and laboratory testing programs.

6.3.2 Grading should be performed in conjunction with the observation and compaction testing services of Geocon Incorporated. Fill soils should be observed continuously during placement and tested to verify proper compaction.

6.3.3 General grading specifications are provided in the *Recommended Grading Specifications* contained in Appendix A. **Where the recommendations of this section conflict with those of Appendix A, the recommendations of this section take precedence**.

6.3.4 Prior to commencing grading, a pre-construction conference should be held at the site with the owner or developer, grading contractor, civil engineer, geotechnical engineer, and City of Carlsbad officials in attendance. Special soil handling and/or grading plans can be discussed at that time.

6.3.5 Site preparation should begin with removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas and soil to be used for fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

6.3.6 Undocumented fill, alluvium, and colluvium within structural improvement areas and fill slopes should be removed and recompacted. The depth of removal should be such that dense, previously placed, compacted fill or natural ground is exposed at the base of the overexcavation. Evaluation of previously placed fills along property edges will need to be evaluated during grading for removal and recompaction.

6.3.7 Alluvium should be removed down to competent formational bedrock or to within approximately 3 feet of the groundwater table, whichever occurs first. During excavation of the alluvium, test pits should be periodically excavated to determine groundwater depths. Special equipment such as swamp cats, excavators, and top loading operations may be required to excavate the alluvium. Removals at the toe of slopes along the channel should extend out at a 1:1 plane from the toe to the bottom of the removal.

6.3.8 Graded areas may expose oversized volcanic/intrusive rock fragments or *floaters* at finish grade. The presence of the rock may impact future development. Consideration should be given to providing a minimum 3- to 5-foot soil cap in these areas.

6.3.9 Oversize rock may be generated during excavation of fill materials and during remedial grading of undocumented fill. Placement of oversize material within fills should be conducted in accordance with the recommendations in Appendix A.

6.3.10 Where practical, the upper 3 feet of the large sheet-graded pads and 12 inches in pavement areas should consist of properly compacted fill or native soils with a *low* expansion potential (Expansion Index less than 50).

6.3.11 To facilitate construction of foundations and installation of site utilities and improvements, consideration should be given to undercutting areas that expose hardrock that is difficult to excavate or requires blasting. As a minimum, hard rock should be undercut to a depth of at least 5 feet in building pads and to a depth of at least 1 to 2 feet below proposed utility lines

6.3.12 Cut and Fill slopes should be constructed at an inclination of 2:1 (horizontal to vertical) or flatter. Cut slopes in bedrock may be stable at inclinations of 1.5:1 and should be evaluated in update reports once grading plans are prepared showing proposed slope heights and inclinations. Fill slopes should be constructed of granular material and compacted out to the face of the finish slope. Engineering analyses should be performed to evaluate the maximum height of cut and fill slopes that possess an adequate safety factor.

6.4 Drainage

6.4.1 Adequate drainage provisions are imperative. Under no circumstances should water be allowed to pond adjacent to footings. The building pads should be properly finish graded after the buildings and other improvements are in place so that drainage water is directed away from foundations, pavements, concrete slabs, and slope tops to controlled drainage devices.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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TR / AML		DSK/GTYPD

VICINITY MAP

QUARRY CREEK II
CARLSBAD/OCEANSIDE, CALIFORNIA

DATE 10 - 20 - 2011	PROJECT NO. 07135 - 42 - 01B	FIG. 1

Vicinity Map

Y:\PROJECTS\07135-42-01B (Quarry Creek) \DETAILS\GV\Vicinity Map.dwg, 10/20/2011 11:57:49 AM, Ladrillono A

GRAPHIC SCALE
0' 75' 150' 225' 300' 450' 600'
SCALE 1"= 150'

CURRENT CONFIGURATION OF POLE LOCATION PER TOPO

PARCEL E
PARCEL F
PARCEL G
PARCEL H
PARCEL I
PARCEL J
PARCEL PM 18502

LOT 1
LOT 2
LOT 5
LOT 6
LOT 7
LOT 9
LOT 10
LOT 12
LOT 14
LOT 15
LOT 16

Qpf
Qudf
Ts
Qcf/Ts
Qcf/Qpcf
Qcf/Qudf/Qal
Qcf/Jspi
Qal
Qt
Qudf/Qal
Qudf/Jspi
Jspi
Qudf/Tv
Tv
Qudf/Ts
Qudf/Qt
Qcol
Qpf/Qcol
Qpf/Qal

GEOCON LEGEND

- Qudf ..... UNDOCUMENTED FILL (Dotted Where Buried)
- Qcf ..... COMPACTED FILL (Dotted Where Buried)
- Qpcf ..... PREVIOUSLY COMPACTED FILL (Dotted Where Buried)
- Qpf ..... PREVIOUSLY PLACED FILL
- Qal ..... ALLUVIUM (Dotted Where Buried)
- Qcol ..... COLLUVIUM
- Qt ..... TERRACE DEPOSIT (Dotted Where Buried)
- Tv ..... VOLCANIC ROCK (Dotted Where Buried)
- Ts ..... SANTIAGO FORMATION (Dotted Where Buried)
- Jspi ..... SALTO INTRUSIVE (Dotted Where Buried)
- ..... APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)

GEOLOGIC MAP

QUARRY CREEK II
CARLSBAD/OCEANSIDE, CALIFORNIA

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SCALE	1" = 150'	DATE	10 - 20 - 2011
PROJECT NO.	07135 - 42 - 01B		FIGURE 2
SHEET	1 OF 1		

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APPENDIX A

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RECOMMENDED GRADING SPECIFICATIONS

FOR

QUARRY CREEK II
CARLSBAD, CALIFORNIA

PROJECT NO. 07135-42-01B

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

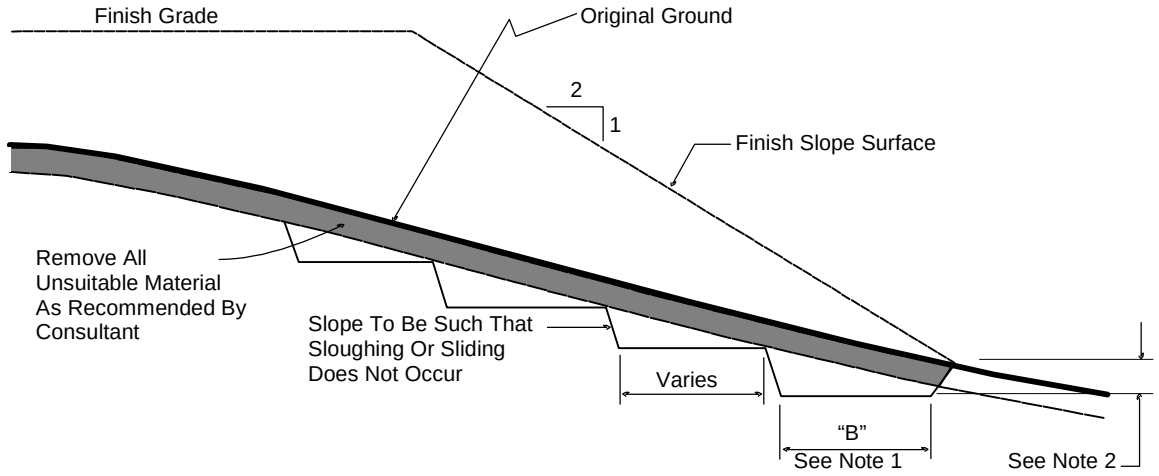
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557-02.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557-02. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the

required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196-93, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. OBSERVATION AND TESTING

7.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5 The Consultant should observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6 Testing procedures shall conform to the following Standards as appropriate:

7.6.1 Soil and Soil-Rock Fills:

7.6.1.1 Field Density Test, ASTM D 1556-02, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938-08A, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3 Laboratory Compaction Test, ASTM D 1557-02, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

7.6.1.4. Expansion Index Test, ASTM D 4829-03, *Expansion Index Test*.

7.6.2 Rock Fills

7.6.2.1 Field Plate Bearing Test, ASTM D 1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

9.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

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